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(71)(72) Applicant and Inventor: SEKETA, Nicholas, F. [US/US]; 21 Beethoven Street, Binghamton, NY 13905 (US).

(74) Agents: WRAY, James, C. et al.; Suite 300, 1493 Chain Bridge Road, McLean, VA 22101 (US).

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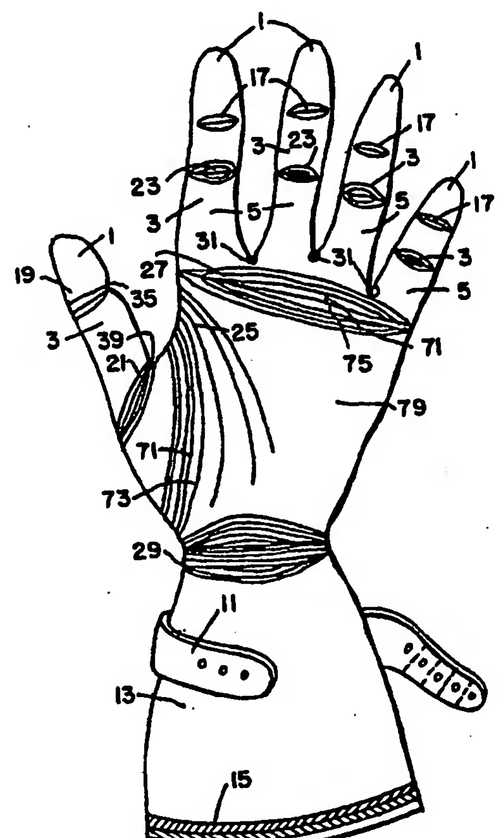
(54) Title: SURGICAL GLOVE AND SUIT

(57) Abstract

Surgical gloves of this invention may be used for either or both of the dominant and non-dominant hands of a surgeon. Other users may use the gloves individually or as a pair to perform other applicable functions. The glove should fit snugly and with comfort. The improvements provide puncture resistant material in one solid sheet (106) at a thickness less than, equal to, or greater than those previously utilized. This invention provides a glove with a thickness greater than those previously designed in areas (17, 13) not critical in tactile sensation, which in turn provides greater puncture protection than those previously designed because it is a solid film which is impervious to body fluids and does not need additional films to act as the fluid resistant barrier. It can be of greater thickness in areas not concerned with tactile sensation due to the flex point (37, 39, 49) and/or wedge design (3, 5, 7, 13). The glove's design allows for good flexibility and whose manufacturing process readily lends itself to mass production at relatively inexpensive costs to the consumer.



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Surgical Glove and Suit

BACKGROUND OF THE INVENTION

This application is a continuation-in-part of patent application serial number 08/014,252, filed February 5, 1993.

Prevention of injury from sharps is a problem of long-standing to medical, dental, and emergency rescue personnel.

SUMMARY OF THE INVENTION

This invention provides disposable clothing and gloves including sterilized surgical gloves and examination and general purpose gloves.

Surgical gloves of this invention may be used for either or both of the dominant and non-dominant hands of a surgeon. Other users may use the gloves individually or as a pair to perform other applicable functions. The glove should fit snugly and with comfort. The improvements provide puncture resistant material in one solid sheet at a thickness less than, equal to, or greater than those previously utilized. This invention provides a glove with a thickness greater than those previously designed in areas not critical in tactile sensation, which in turn provides greater puncture protection than those previously designed because it is a solid film which is impervious to body fluids and does not need additional films to act as the fluid resistant barrier. It can be of greater thickness in areas not concerned with tactile sensation due to the flex point and or wedge design. The glove's design allows for good flexibility and whose manufacturing process readily lends itself to mass production at relatively inexpensive costs to the consumer.

The gloves are used alone or with other materials, as a single layer or as a multithickness solid film or as a film with a coating whose properties serve different purposes such as chemical resistance, vapor resistance, thermal protection and electrical shock protection.

One film, whether it be of solely one material or a combination of materials, provides the solid film barrier for

resistance to exchange of body fluids and cut and puncture by sharp instruments. This significant difference enables the manufacture of a glove at the same thickness at the finger tip level as its predecessors, while providing more puncture resistant material because coatings or films do not have to be applied to prevent body fluid exchange.

The palmar surface can be constructed and then adhered by any means, including friction, to a glove (if so desired or required for unique applications).

These and other objects, features and advantages of the present invention are apparent within the following description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF FIGURES

Figure 1 depicts a view of right hand palmar surface.

Figure 2 depicts a view the dorsum of the right hand.

Figure 3 depicts a side view of the lateral surface of the right hand.

Figure 4 depicts a side view of the medial surface of the left hand.

Figure 5a depicts a typical finger with flex points.

Figure 5b depicts a typical finger with straight accordion fold.

Figure 5c depicts a typical finger with the flex tubules and the stepped wedge design.

Figure 6 depicts an engaged two piece attachment mechanism, the peg lock.

Figure 7 depicts an engaged two piece attachment mechanism, the peg lock.

Figure 8 depicts an oriented film.

Figure 9 depicts an overview of a three piece attachment mechanism, the taper lock.

Figure 10 depicts the taper sleeve, taper lock, and "o"ring.

Figure 11 depicts the "o"ring with pull tab.

Figure 12 depicts an engaged 3 piece sealing mechanism,

the taper lock.

Figure 13 depicts an engaged 3 piece sealing mechanism, the taper lock with safety tab and releasing tool.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figures 1-4, the segments of each finger are attached to each other by the flex tubule 33, 37. Each finger is attached to the palm by a flex tubule 41, 43. The thumb is attached to the palm by a flex tubule 39, and the palm is attached to the forearm by flex tubules at the wrist 49. The glove is secured to the forearm by an adjustable strap 11 which is attached to the glove. The backside of the hand or dorsal surface 79 is attached to the accordion folds of the metacarpophalangeal joint 27 and the accordion folds of the wrist 29. At or near the end of the glove or the forearm segment is the site for an additional closure mechanism 15 which may be embossed into the film or adhered to the inner or outer surface which could be utilized to secure the glove to the gown of an operator in such a manner that the glove and gown attached at the arm unit are one. Accordion expansion joints of the dorsum of the fingers 17, 23 and hand 27, 25 provide expansibility. The thumb segments are attached to each other by the accordion folds 19 and the thumb is attached to the hand by the accordion folds 21. The hand is attached to the forearm by the accordion folds 29.

Due to the fact that the thumb has a unique anatomical design and performs unique functions, special consideration is given to the design of the flex points to compensate for the compound actions resulting from flexing of the metacarpophalangeal joint and the metacarpal trapezium joint of the wrist. Figure 2 shows the dorsal accordion folds 19, 21, 25, and the lateral surface of the thumb. The accordion folds form an apex located at about the junction of the lateral surface with the palmar surface. This design is also present on the medial surface of the thumb. In the mirror image of this same design, the dorsal accordion folds 19, 21

and its apex at the midpoint of the joint, in which the folds meet at the junction of the palmar surface with the medial and lateral surfaces, a palmar flex tubule is located at the midpoint of the joint 35, 39.

A strap 11 secures the glove to the forearm. The strap 11 is one solid film. One portion has protuberances along its center which are taper shaped pegs, and the other portion of the solid film has tapered holes which are slightly smaller than the pegs. The strap also is constructed with perforated break lines between the locking perforations to facilitate removal of excess strap. When the pegs and perforations are united, the strap locks, and the pegs do not protrude beyond the perforations.

The ovoid areas of the distal segments 51 may be constructed thinner to allow greater tactile sensation. The ovoid areas can have a film or can be embossed to increase gripping ability. The figures also depict other areas of the glove with grippers 69 to increase gripping ability. The preferred gripper has an embossed ovoid area, which improves the operator's tactile ability and increases gripping and holding ability.

The preferred number of accordion folds per joint are depicted in Figures 1, 2, 4 and 5a. The distal interphalangeal joints 17 have three accordion folds. The most distal fold 53 is arc-shaped or curvilinear, with the apex of the arc directed towards the finger tip. The first fold 53 is directed in a linear fashion at an angle of about 45 degrees in which the fold is directed in a dorsal distal direction and about the upper third or half of the medial and lateral surface. It arcs in a distal fashion so that the apex of the arc is directed distally and its apex is at the proper distance from the midpoint of the joint on the dorsal surface. The shape of the fold is preferably a bell curve. The second fold 55 is bell-curved and straight, transacting the joint, and the third fold 57 is the mirror image of the first fold 53. The proximal interphalangeal joint accordion

fold 23 consists of five folds. The first fold 61 mimics the first fold 53 of the distal interphalangeal joint 17. The second fold 63 can extend to the apex created by the first and last folds, or the fold does not have to extend to the apex. However, it must be present on the upper third or half of the medial and lateral surfaces as the dorsal surface. The fold is located at the preferred distance and is the preferred shape. If the fold does not go to the apex, the fold is curvilinear. If the fold extends to the apex, its appearance is the same as the first fold 61. The third fold 65 is bell-curved and straight, which in essence transacts the joint. The fourth fold 67 is the mirror image of the second fold 63. The fifth curve 81 mimics the last fold of the distal interphalangeal joint 57. The metacarpophalangeal joints 27 consist of eight accordion folds. The first fold mimics the first fold of the distal interphalangeal joint 53. The second fold and third fold mimic the second fold of the proximal interphalangeal joint 63. The fourth fold 75 is straight and begins at the first metacarpophalangeal joint in essence as a flex tubule 41, travels to the medial surface of the hand, across the dorsum of the hand and around the fifth metacarpophalangeal joint, and re-establishes itself as the flex tubule. After transacting the second metacarpophalangeal joint, the fourth fold 75 terminates on itself in the second interspace of the hand. The fifth fold 77, at the fifth metacarpophalangeal joint, is a flex tubule 43 and is directed laterally along the lateral surface of the hand. The fold is found on the dorsal and medial surfaces of the hand and then transacts the first metacarpophalangeal joint and ends on itself at the distal third of the fifth metacarpal. The sixth and seventh folds mimic the fourth fold 67 of the proximal interphalangeal joint. The eighth fold mimics the third fold of the distal interphalangeal joint 57.

Special consideration must be given to the thumb. The interphalangeal joint 19 consists of three accordion folds.

The first 83 mimics the distal interphalangeal joints' first fold 53; the second 85 is straight; the third 87 mimics the third of the distal interphalangeal joint 57. The metacarpophalangeal joint 21 consists of five accordion folds arranged the same as that of the proximal interphalangeal joints 3 of the fingers. The first fold 89 mimics the first of the proximal interphalangeal joint 61. The second 91 mimics the second of the proximal interphalangeal joint 63. The third 93 is straight. The fourth 95 mimics the fourth of the proximal interphalangeal joint 67. The fifth 97 mimics the fifth of the proximal interphalangeal joint 81.

The thumb, because of its distinctive range of motion, requires a flex point for the metacarpal trapezium joint 25. This joint consists of eight accordion fold. The eighth accordion fold begins at the web space of the thumb and index finger. The first fold mimics the first accordion fold of the proximal interphalangeal joint 61 with this difference. At the upper half or third of the web space, the joint begins to arc eccentricly in a dorsal proximal direction and ends on itself on the dorsum of the hand short of the wrist. The second and third accordion folds mimic the second of the proximal interphalangeal joint 63 of the fingers with this significant difference. About the upper third or half of the web space the folds begin to arc in a eccentric fashion in a dorsal distal direction and end on themselves on the dorsum of the hand short of the wrist. The fourth and fifth folds are straight. The fourth fold 71 circumscribes the joint, travels around the thenar eminence as a flex tubule 45 and returns to its point of origin. The fifth fold 73 follows the course of its mate, at a point beyond the area known as the anatomical snuff box the fifth fold diverges from the course with its mate as a flex tubule 47 and follows a course to about the center of the palm and ends on itself The sixth and seventh folds mimic the second fold of the proximal interphalangeal joint 63 with this difference. Their angle may be less than the 45 degrees, and, at the upper third or

half of the web space, they arc back on themselves and in a curvilinear line end at a point past the anatomical snuff box. The first fold mimics the fifth fold of the proximal interphalangeal joint 81 with this difference. Its angle may be less than 45 degrees and at the upper third or half, it arcs in a dorsal proximal direction almost becoming straight and ends just past the anatomical snuff box.

The accordion folds of the wrist 29 are thirteen in number; the first fold is the same as the first fold of the distal interphalangeal joint 53. The next four folds mimic the second fold of the proximal interphalangeal joint 63. The next three are straight and transect the joint and mimic the middle fold of the proximal interphalangeal joint 65. The next four folds mimic the fourth fold of the proximal interphalangeal joint 67. The last fold mimics the last fold of the proximal interphalangeal joint 81. Note the mathematical sequence of the number of straight folds and the curvilinear folds. The web spaces of the fingers have three accordion folds 31. The folds are linear and have the preferred design. Their longitudinal axis is perpendicular to the palmar surface and they extend from the junction of the palmar, medial and lateral surface at the metacarpophalangeal surface to the junction of the dorsal, medial and lateral surface of the metacarpophalangeal joint. The strap 11 in Figures 14 is no greater than 5/64" in thickness and about 1" in width. The strap is attached to the glove as a single unit, which contains a segment having pegs along its center and another segment having perforations along its center. The pegs are 1/16" in median width and height. The perforations are the full thickness of the strap and are slightly less than 1/16" in width. Along the perforation segment of the strap and between the perforations are located breaklines which allow the operator to remove excessive strap. A second closure 15 is located at or near the end of the forearm segment. The seal is a locking strip is of the same dimensions of the strap 11, which creates a

second means of preventing contamination of the operator with infectious material, because the locking strip attaches the glove to the gown of the operator enabling the operator to remove the glove and gown safely as a one piece unit.

Figure 5a is a detailed of preferred flex points of the proximal and distal interphalangeal joints. The proximal interphalangeal joint is located between the proximal phalangeal segment 5 and the middle phalangeal segment 3. The distal interphalangeal segment is located between the middle phalangeal segment 3 and the distal phalangeal segment 1. The flex point has accordion folds and a palmar tubule. The distal interphalangeal joint has three folds. The first fold 53 is angled about 45 degrees to the palmar surface. The first fold is linear in shape and extends in a dorsal distal direction. At about the upper half or third of the medial and lateral surfaces the first fold becomes curvilinear and arcs across the dorsum of the finger. The apex of the arc is located a preferred distance from the midpoint of the joint. The second accordion fold 55 is straight and is located at the midpoint of the joint. The fold circumscribes the joint. On the palmar surface, the second fold is the flex tubule of the joint 33. The third accordion fold 57 is angulated and is the mirror image of the first fold.

The proximal interphalangeal joint flex point consists of five accordion folds. The first accordion fold 61 mimics the first fold of the distal interphalangeal joint 53. The second accordion fold 63 is curvilinear and does not have to extend to the apex created by the first and last accordion folds. The apex of its arc is located on the dorsal surface of the joint and is spaced between the first and third folds. The third accordion fold 65 is straight and has the same characteristics as that of the distal interphalangeal joint 55. The fourth accordion fold 67 is the mirror image of the second accordion fold 63. The fifth accordion fold 81 is the mirror image of the first accordion fold 57. Four are angulated and one is straight. The segment of the straight

accordion fold which transverses the palmar segment of the glove is known as the palmar tubule.

Figure 5b depicts the straight accordion folds of a typical finger of the preferred design. The segments 1, 3, 5 are attached to one another by the accordion folds 55, 63. The accordion folds on the palmar surface are the flex tubules 33, 37.

Figure 5c depicts the palmar surface of a finger. The surface is continuous. The distal phalangeal segment 1 is attached to the middle phalangeal segment 3 by the flex tubule of the distal interphalangeal joint 33. The flex tubule is tapered in thickness to reflect the difference in thickness between segments 3 and 1 and is 1/16th" in depth. The flex tubule of the proximal interphalangeal joint 37 has the same characteristics as that of the distal flex tubule 33 and connects the palmar surface of the middle phalangeal segment 3 and the proximal phalangeal segment 5. The proximal phalangeal segment is attached to the palm of the hand 7 by the metacarpophalangeal joint flex tubule 41. This palmar tubule has all the qualities of the others with one variation; it is 2/16th" in depth.

Figure 6 depicts an engaged two piece attachment mechanism, the peg lock. The two halves 100, 102, when united, allow for the glove to be firmly secured to the suit. A gasket 101 may be placed between the two halves 100, 102 to form a seal preventing both liquid and airborne transmission of pathogens to the operator. The gasket is attached to the inner surface of the gloveside closure mechanism 100. The gasket 101 may not be necessary in all applications. One portion of the attachment mechanism 100 is attached to the glove 98. The other portion of the closure mechanism 102 is attached to the suit. If one lifts the tab 112 of the glove plastic closure 100, the peg lock will open for the removal of the glove from the suit. The plastic halves 100, 102 of the mechanism snap together to form a compression fitting. Additional coatings or films may be applied to the surfaces

of 99, 100, 102 and 103 to provide additional chemical resistance. The inner surface of 100 the gloveside plastic closure may have evenly spaced ribs to provide additional strength to the piece.

Figure 7 shows one variation of the engaged two piece attachment mechanism, the peg lock. The two halves 100, 102, when united allow for the glove to be firmly secured to the suit. A gasket 101 may be placed between the two halves 100, 102 to form a seal preventing both liquid and airborne transmission of pathogens to the operator. The gasket is adhered to the inner surface of the gloveside closure mechanism 100. The gasket 101 may not be necessary in all applications. One portion of the attachment mechanism 100 is attached to the glove 98. The other portion of the closure mechanism 102 is attached to the suit. If one lifts the tab 112 of the glove plastic closure 100 the peg lock will open for the removal of the glove from the suit. The plastic halves 100, 102 of the mechanism snap together to form a compression fitting. Additional coatings or films may be applied to the surfaces of 99, 100, 102 and 103 to provide additional chemical resistance. The inner surface 100 of the gloveside plastic closure may have evenly spaced ribs to provide additional strength to the piece. In this figure the suit peg 102 is broader at its tip, and wider in body. Other variations of the peg lock are possible.

Figure 8 depicts an oriented film. The oriented film and equilateral triangles were extruded as a film and then pulled for orientation.

Figure 9 is an overview of the three piece taper lock attachment mechanism. The suit 104 is attached to the taper lock 107 using an "O" ring 109. The "O" ring may be attached to the suit 104 or slid over the arm of the suit. The taper lock 107 is slid over the hand and up the forearm of the suit. The taper lock 107 is attached to the "O" ring 109. The taper sleeve lock 108 can either be slid over the glove 98 or attached to the glove 98. The taper sleeve lock 108 is

then inserted into the taper lock 107.

Figure 10 provides a more detailed view of the components of the 3 piece taper lock attachment mechanism. Additional coatings or films may be applied to the surfaces 108, 107,109 to provide additional chemical resistance.

Figure 11 demonstrates an "O" ring with a pull tab to facilitate disengagement from the taper lock if the operator desires to remove the glove from the suit.

Figure 12 depicts a taper lock engaged with the addition of the safety lock. A safety lock 11 is added to the taper lock 107. This additional closure supplements the attachment mechanism.

Figure 13 is another depiction of the engaged taper lock attachment mechanism with a release assembly tool 112. The tool 112 is inserted at 113 to disengage the safety lock 111 from the taper lock 107.

A flex point is the embossed area of the joint. Accordion folds are present on the dorsal, medial and lateral surfaces. One segment of the accordion fold is not angulated. It is a straight segment. This segment may circumscribe the joint; the portion of this fold which traverses the palmar surface is the flex tubule. The flex tubule does not have to be a part of the straight accordion fold; it can be a bell shaped curve located on the palmar surface of the glove. The flex point therefore consists of two segments, the accordion fold and the flex tubule.

As a generic overview of the accordion fold or flex point concept, the following explanation is offered. The accordion folds should have the following qualities. The first and last accordion folds should meet. The apex of the first and last fold is located about the center of the joint at the junction of the palmar, medial and lateral surfaces. If the joint allows for motion in more than one plane, the first and last fold must meet at one midpoint of the joint at the junction of the palmar medial surface or palmar lateral surface along that plane. In a typical interphalangeal

joint, the first fold is directed in a linear fashion it an angle of about 45 degrees in which the fold is directed in a dorsal distal direction. At about the upper third or half of the medial and lateral surfaces, the fold arcs in a distal fashion so that the apex of the arc is directed distally, and its apex is at a distance from the midpoint of the joint on the dorsal surface.

The straight accordion folds of the flex point do not necessarily have to circumscribe a joint if the joint has movement in more than one plane. In this case, it is necessary for the straight tubule to traverse either the entire portion of the surface or a portion thereof of the palmar surface of the joint.

Two straight folds may unite to form one tubule.

The last fold is the mirror image of the first unless the motion of that joint occurs in more than one plane. The folds are curvilinear in design except those that are specified as being straight. If more than one straight fold is present, at least one must join the first and last folds at their apex. If only one straight fold is present, it must meet the first and last folds at both their apices.

The folds are embossed at an angle of 90 degrees into the full thickness of the film and may be tapered or angulated. The edges of the accordion folds are circular or bell curved in shape; no sharp edges are present along the fold. The flex point may be a combination of geometric shapes.

The folds are equally spaced along the joint, and if any film is located between the folds, it has no design imparted to it. The flex points may be placed before or after the joint; in the preferred design the flex point is located about the midpoint of the joint. The distance between the apices of the first and last arcs of the accordion folds which span the joint in the preferred design is the following: 1/4" for the distal interphalangeal joint and interphalangeal joint of the thumb, 1/2" for the proximal

interphalangeal joint and the metacarpophalangeal joint of the thumb, 3/4" for the metacarpophalangeal joint and the metacarpal trapezium joint of the thumb, and 1 1/4" at the wrist. The preferred design of the accordion folds is that of the bell curve.

A number of methods and designs are feasible. The preferred method will provide the least expensive means which can produce the highest quality product.

The preferred material is extruded oriented nylon sheet, a flexible, tough and tactile oriented polymeric material, monofilament fishing line or its equivalent or nylon. The preferred material, nylon, may be combined with or substituted with polymers, co-polymers, resins, aramids, Fiberglas, acrylics, cyanoacrylics, ceramics, carbon fiber, salts, metals, composite materials, elastomers and other puncture resistant materials. The material may take shape or form as a single homogeneous film, or a blend of materials. The glove should be of excellent construction, materials and not fit sloppily on the hands of a surgeon.

Weaves, filaments or fibers which are bonded together by chemical bonding or any other means will result in a the non-porous material of the invention. Preferably the material is injection molded under high pressure, providing oriented quality.

When a solid sheet of nylon or the preferred material has heat and pressure applied to it, the resultant solid sheet of material takes the shape of the object the sheet is pressed into. When allowed to cool in this shape, the shape is retained by the material. If a deforming force is applied to the material, such as elongation of a hollow geometric shape or portion of a geometric shape such as bell curve or almost complete circle, the material deforms. When the deforming force is removed from the material, the material returns to its original shape.

The material may or may not take shape as a smooth solid film, for example the solid film may have a geometric or

partial geometric surface contour such as a series of semicircular halves bonded together in a solid sheet.

The material has memory, and this inherent quality can be utilized to aid the ability to lengthen and shorten. The material returns to its original shape when the deforming force is removed. Thus, a material becomes more flexible because the material's ability to bend on itself is facilitated.

The preferred design for the flex points of the glove are as follows. In the description of the accordion folds, the most distal fold or the fold closest to the finger tip is the first accordion fold. The last accordion fold is the most proximal or the fold which is closest to the cuff. The accordion folds for the joints are 1/16th" in height and width. They are bell shaped curves, and they are embossed the full thickness of the film with the mean chord of the curve at an angle of 90 degrees to the film. They are linear and curvilinear taking the shape of arcs which span the medial, lateral and dorsal surfaces of the joints. Three accordion folds are present at the distal interphalangeal joint. The first fold begins at about the midpoint of the joint at the junction of the palmar surface with medial and lateral surface of the joint. The second fold spans the joint and is straight; it begins at the junction of the palmar surface with the medial and lateral surfaces. The third fold begins at the junction of the palmar surface with the medial and lateral surfaces of the joint about the midpoint of the joint. The first and third folds meet at the approximate center of the joint at the junction of the medial and lateral aspect of the joint. The first and third folds extend from the apex at an angle of about 45 degrees from the palmar surface. The first fold is directed in a dorsal distal direction to the upper third or half of the surface. At about this point the fold begins to arc, with the apex of the arc directed distally. The last fold is the mirror image of the first. On the palmar surface of this joint is located

about its midpoint a flex tubule. The flex tubule is a bell curve in shape, 1/16th" in diameter and height which has been embossed at 90 degrees into the full thickness of the film, in essence it is the palmar portion of the straight accordion fold of the joint. The mean chord of the bell curve is perpendicular to the palmar surface.

The proximal interphalangeal joint consists of five accordion folds. The first two arc distally; the third is straight, and the last two are curvilinear with the apex of the curve directed proximally. The first and last fold are the same design of the distal interphalangeal joint. The second and fourth folds do not extend to the junction of the palmar surface with the medial and lateral surfaces; they are curvilinear and traverse the entire dorsal surface and end on the upper third or half of the medial and lateral, surfaces. The second fold has the apex of the arc located on the dorsal surface directed distally and about equidistant between the first and third folds. The fourth fold is the mirror image of the second fold. The folds are 1/16" in height and width, 90 degrees to the film, and are embossed full thickness into the film. The palmar flex tubule is the same as that of the distal interphalangeal joint. The medial and lateral surfaces of the fingers should be concaved. The dorsal and palmar surfaces may be slightly concaved. The fingers taper with the widest portion of the finger located at the metacarpophalangeal joint and the narrowest at the distal phalangeal segment.

The web spaces of the fingers have three accordion folds which are linear. The film thickness is about .007". Longitudinal axis of the folds are perpendicular to the palmar surface and extend from the junction of the palmar, medial and lateral surfaces at the metacarpophalangeal surface to the junction of the dorsal, medial and lateral surfaces of the metacarpophalangeal joint. The web spaces of the fingers have three accordion folds to accommodate the abduction and adduction of the fingers. The longitudinal

axis of the ribbing or accordion folds connect with the dorsal and palmar surfaces. They have the same preferred characteristics as described.

The metacarpophalangeal joint accordion folds are eight in number. The first three arc distally, the middle two are straight, and the last three arc proximally. The first and eighth folds are the same as the first and fifth folds of the proximal interphalangeal joint. The middle two folds extend to the junction of the medial and lateral surfaces with the palmar surface, with this significant difference. The fourth fold is straight and begins at the first metacarpophalangeal joint in essence as a flex tubule and travels to the junction of the palmar and medial surface of the hand, across the medial and dorsum of the hand as a straight accordion fold and then around to the lateral surface of the hand. At junction-of the lateral and palmar surfaces at the fifth metacarpophalangeal joint, the fold re-establishes itself as a flex tubule. After transacting the second metacarpophalangeal joint, the fold terminates on itself in the second interspace of the hand. The fifth fold forms on the palmar aspect of the fifth metacarpophalangeal joint, in essence as a flex tubule, and is directed laterally along the lateral surface of the hand where it is a straight accordion fold. The straight fold is found on the dorsal, medial and lateral surfaces of the hand and at the junction of the palmar and medial surfaces becomes a flex tubule once again. The fold then transacts the first metacarpophalangeal joint and ends on itself at the distal third of the fifth metacarpal. When one flexes a palm to its maximum, the two tubules are adjacent to one another; in essence, they become one. The second and third folds mimic the second fold of the proximal interphalangeal joint. The sixth and seventh folds mimic the forth fold of the proximal interphalangeal joint. The folds are 1/16 " in height and width, 90 degrees to the film, and are embossed full thickness into the film. The palmar flex tubule's design is the same as that of the

proximal interphalangeal joint with this difference; the width and height of the tubule is 2/16th".

The design of the thumb interphalangeal joint is the same as that for the distal interphalangeal joints of the fingers. The design of the metacarpophalangeal joint of the thumb is the same as that of the proximal interphalangeal joints of the fingers. Due to the unique ability of the thumb to oppose the little finger, in which the motion occurs at the metacarpal trapezium joint, a flex point is placed at that joint to accommodate the motion. The joint has eight accordion folds with an unique arrangement to accommodate the particular action of allowing the thumb to oppose the little finger. Since it is impossible to place the accordion folds for the thumb adjacent to each side of the joint, it is necessary to have a place of origin or termination of the folds in the area of an imaginary line which would mimic the position of a line through the joint. The first, second and third accordion fold begin at the web space of the thumb and index finger and mimic the first and second accordion folds of the proximal interphalangeal joint with these exceptions. Their arcs are eccentric in nature, and they end on themselves on the dorsum of the hand. The fourth and fifth folds are straight. The fifth fold follows the course of its mate and, at a point beyond the area known as the anatomical snuff box, the fifth fold diverges from the course with its mate as a flex tubule and follows a course to a point at about the center of the palm and ends on itself The fourth fold circumscribes the joint, travels around the thenar eminence as a flex tubule and returns to its point of origin. The sixth and seventh mimic the fourth fold of the proximal interphalangeal joint, with this difference. The angle may be less than 45 degrees, the arcs of the curves are much flatter, almost straight, and the folds end at a place on the hand just beyond the anatomical snuff box. The eighth accordion fold mimics the fifth fold of the proximal interphalangeal joint with this difference. The angle may be

less than 45 degrees, the arc of the curve is flatter, almost straight, and the fold ends at a place on the hand just beyond the anatomical snuff box.

The palmar surface of the palm is contoured such a manner resembling one's palm. The medial and lateral surfaces of the palm are concave with the concavity directed away from the operator's skin. The palmar flex tubules of the palm are placed to allow apposition of the thumb with other fingers and to allow one to grip an object.

The accordion folds of the lateral surface of the palm are five in number and may be linear or curvilinear. The folds begin in an area which corresponds to the proximal portion of the metacarpophalangeal joint and extend distally to an area just before the wrist. The arc apexes of the folds are directed towards the junctures of the dorsal and palmar surfaces of the glove. Accordion folds are located along the lateral border of the palm and stop short of the accordion fold for the metacarpophalangeal joint and the wrist to accommodate for any expansion of the hand when making a fist. The folds have the same characteristics as the other accordion folds of the glove. The accordion folds are 1/8th" in size, and the first two folds arc dorsally. The third accordion fold is straight, and the last two accordion folds arc palmarly.

The wrist has thirteen dorsal accordion folds. The first five folds arc distally, the next three are straight, and the last five arc proximally. The accordion folds are 3/16" in size. The folds are constructed in the same fashion as the other joints. The first and last folds must join together at the junction of the palmar surface with the medial and lateral surfaces. Three palmar tubules are present, which are 3/16th" in size and embossed at 90 degrees to the surface. The tubules are evenly spaced on the palmar surface of the wrist. The first and last tubule are about 1 1/4" apart.

Eight accordion folds located on the lateral surface of

the forearm extend from a point just before the wrist and end at a point about 1-1 1/2" from the second closure mechanism. The folds are 3/16th" in width and height. The folds are embossed full thickness into the film and are bell curves with the mean chord of the figure at 90 degrees to the film. The folds begin about 1/16th" from the accordion folds of the wrist and terminate at the end of the glove when a second closure mechanism is not employed. The preferred design has a second closure mechanism.

The flex point designs of the glove may be coated with a non-toxic, non-stick material which enables the glove to remain free of any debris, as debris can interfere with the flexion mechanism.

The cuff is tightened by use of a tab system similar to that of adjustable hats. The strap attachment to the glove may be by any means or be embossed from the glove itself The preferred means is to have the strap attached to the glove. The strap is about 5/64" in thickness and about 1" in width. The strap is attached to the glove as a single unit which contains a segment having pegs along its center. Another segment of the strap has perforations along the center. The pegs are 1/16" in median width and height; the perforations are full thickness of the strap and slightly less than 1/16" in width. This allows for the strap to stay securely closed. Along the perforation strip portion of the strap, between the perforations are located break lines which allow the operator to remove excessive strap. Small soft flexible loops may be attached to the outer surface of the forearm to help keep the strap in its proper location. On the inside surface of the glove, at the same location as the strap attachment, a pliable conforming film circumscribes the forearm segment or extends along the longitudinal axis of the forearm. The soft pliable film located beneath the strap is wider than the strap. The seal may also take the form of a sealed chamber or bladder which is adhered to the inner or outer surface or formed within the layer of the forearm segment. Air may be

injected into the chamber via a pump which is inflated by the operator with an adjustable valve to create a fluid resistant barrier by pressure. The air bladder is adhered to the inner surface of the glove by welding and or adhesives. The pump is located on the inner or outer surface of the forearm, and the bladder is inflated prior to sealing the second closure mechanism. If the air pump is located on the outer surface, the pump requires a connection through the forearm film to the bladder. The location of the sealed cavity may be at a location other than that of the adjustable strap. The area on the forearm may contain two seals. One is flexible and prevents seepage of fluid into the glove at or near the end of the forearm segment of the glove. A second seal either is embossed in a full or partial thickness of the forearm segment of the glove's film or is attached to the forearm. The seal may be in the form of a seal similar to that of a zip lock bag, which would interlock with its mate on the forearm of the operator's sleeve of the gown or protective clothing. Alternatively, the second seal can be of any reconfiguration and can use any material which insures fall closure of the glove with the operators gown or protective clothing. This mechanism would then create a body fluid resistant barrier suit. The preferred seal is attached to the glove. This type of suit would allow the operator to remove the glove and gown as one unit. The operator's skin does not come into contact with any body fluid, debris and or infectious material. This type of configuration is applicable for other purposes such as environmental accident cleanup suits.

The joints of the fingers and hand are of extreme importance. A problem which exists with nylon is that nylon is relatively stiff. Flexing the finger demands that the dorsal surface must extend in length, and the palmar surface must shorten in length. The solution to that problem is to allow for that shortening and lengthening to occur at the joint area. Incorporating the flex point design with the

stepped or tapered wedge design allows this to occur. These elongation and shortenings can occur with the flex point design alone. The tubular, rib or accordion design of the dorsum of the fingers and hand allows for extension of that surface, and the tubular design of the palmar aspect of the fingers and hand allow for contraction of the material. The medial and lateral surfaces of the fingers, thumb and wrist also have the ability to lengthen and shorten, utilizing a stiff or somewhat stiff material. The design for the medial and lateral surfaces of the fingers and hand is incorporated in the preferred design imparted to the joint areas (the flex points). These designs allow for the elongation and shorting of the surface, as tested and proven using an acrylic to define the significant lines of stress resulting from finger flexion.

The test results demonstrated that the dorsal medial surface of the finger elongates and the palmar medial aspect of the finger shortens. The test lines also curved in an arc shape with the apex of the arc directed dorsally. This observation is extremely critical when dealing with stiff materials, more so than when dealing with somewhat flexible or flexible materials. An acrylic or latex glove has the ability to extend to lengthen and when subjected to compound stress. Nylon and other stiff materials does neither. If the lengthening and shortening of the surface is not properly addressed, the stiff material with either bulge grossly out away from the finger in a fashion which is unacceptable, or will inhibit the ability to flex the joint. These problems were demonstrated with the acrylic glove, and these problems were overcome with the preferred design.

The preferred sizes of the flex tubules are 1/16th" for the distal interphalangeal joint, 1/16th" for the proximal interphalangeal joint, 2/16th" for the metacarpophalangeal joint and the palm, and 3/16th" for the wrist. The thumb flex tubule is 1/16th" for the interphalangeal joint and 2/16th" for the metacarpophalangeal joint. Alternatively,

the flex tubules can increase is size going from 1/16th" at the distal interphalangeal joint, 1/8th" at the proximal interphalangeal joint, and 3/16th" at the metacarpophalangeal joint or can be totally variable.

A straight accordion fold may have all or part of the same width and depth as its flex tubule. The angulated tubule may have the same width and depth as to the flex tubule it joins. The depth of each palmar flex tubule may be greater than its width. The preferred shape of the flex tubule and its angulated counterparts is that of the bell curve.

The bell curve should be tapered in thickness to insure coincidence with the adjoining segments thickness. Concurrently, the palmar surface maintains a constant thickness, and the walls of the medial and lateral surfaces are tapered to insure coincidence of all surfaces and segments. The flex tubule is embossed in the full thickness of the film in the preferred design. In the preferred design, the flex tubule circumscribes the joint, and functions as one of the straight accordion folds.

The glove is constructed with some or all alternate designs replacing the preferred design, or in combination with some or all other alternate designs. All or some of the following modifications can be made to the preferred design.

In an alternate design of the flex tubule, the flex tubule is located behind the midpoint of the Joint and does not function as the straight accordion fold. The palmar flex tubule may have variations. Variations include angulated tubules which may be constructed at an angle other than 45 degrees to the palmar surface. The tubules are embossed the full thickness of the film and have a tapered bell curved shape. The tubules may extend along the dorsal, medial, and lateral surfaces in a distal dorsal direction away from the palmar flex tubule. If the tubules extend only along the medial and lateral surfaces, they terminate about the center of the longitudinal axis of the surfaces wherein the dorsal

accordion folds are constructed to compensate for the angular deflection. A mirror image of the anteriorly directed tubule can be present. The tubule may be embossed anywhere along the palmar surface away from the flex point area. The flex tubule may be a combination of geometric shapes. These additional tubules are not found in the preferred design; they may be used as enhancements in alternative designs. Alternatively the flex tubule can be of the thickness of the thinner segment, the thicker segment, a thickness which is a combination of both the thicker and thinner segment, or a constant thickness.

In an alternate design, a concentric circle design is utilized, circumscribing the flex points. The spacing between concentric circles and the depth of the resultant ridges should cumulatively approximate the length that the surface must shorten or lengthen. The material, nylon, is stiff. However, concentricity similar ridging as in a "soda fountain" straw provides the degree of flexibility required to achieve acceptable levels of dexterity. An interesting quality of nylon is that it has memory in which it returns to its original shape when the deforming force is removed. Thus, the material has the ability to move on itself when a deforming force is applied, and returns to its original shape due to the material's memory. With utilization of the variety of flex point designs and the wedge designs, there is increased ability to bend a stiff material. In the preferred design, the mean chord of the geometric shape is embossed at a 90 degree angle into the film.

Alternatively, the mean chord of all geometric shapes or portions thereof may be embossed at an angle other than the 90 degree angle and may be substituted for preferred geometric shape, the tapered bell curve.

In an alternate design, the flex points of the fingers, thumb and wrist can be formed with one or more accordion folds which completely encompass the joint or extend over a part of the joint and have the same thickness as that of the

adjacent distal thickness or that of the thickness of the distal portion of the finger. For example, the thickness of the fibbing of the proximal phalangeal joint is 0.021 " in thickness or 0.007" in thickness. Alternatively, all of the flex points may be of the same thickness as that of the distal segment, .007". The height of the fib would be approximately 1/16". The ribbing can completely encompass or partially encompass the joint and have the convexity directed either away from the operator's skin surface or with the concavity about 1/16" directed towards the operator's skin surface. The convexity and concavity does not protrude, or, if it does, it does not protrude significantly, so that the exterior surface of the glove is relatively flat.

The preferred thicknesses of the glove are .007" for the distal phalangeal segment, the medial and lateral surfaces of the glove and the dorsal surface of the glove. The middle phalangeal segments and the proximal phalangeal segment of the thumb are.014" in thickness. The proximal phalangeal segments of the glove are .021 " in thickness as well as the thenar eminence. The palm of the glove is .035" in thickness. The forearm portion of the glove is .055" in thickness. This design is the stepped wedge. In a tapered wedge. the same measurements and relationships exist for the median chord of each segment. Alternatively, all the surfaces of the glove can be of one thickness, or they may have any combination of thicknesses, or the palmar surface can differ from the preferred design.

The glove can be constructed with some or all alternate designs replacing the preferred design, or in combination with some or all other alternate designs. All or some of the following modifications can be made to the preferred design.

In alternate design I of a flex point, the accordion folds meet at the junction of the medial and lateral surfaces with the palmar surface. They have all the characteristics of the preferred design. The apexes of the accordion folds are located about the center of the joint. The flex tubule

is located behind the midpoint of the joint at a position in which the apexes of the accordion folds can move proximally towards the wrist or immediately behind the apex. The palmar flex point has all the characteristics of the preferred design. The pie shape of the accordion ribs encompasses the entire joint. This design allows for the extension of the dorsal surface and the extension and shortening of the medial and lateral surfaces.

In alternate design II of a flex point, the joint is one in which the flex point circumscribes the joint as in the preferred design. The accordion ribbings extend from one central point starting at the midpoint of the joint and about the middle of the longitudinal axis of the medial and lateral surfaces. All other components of this design have the characteristics of the preferred design.

In alternate design III of a flex point, the preferred design is embossed into the joint. In the area of the glove which would correspond to that of the phalangeal shaft, accordion folds are placed on the medial and lateral surfaces of the glove to accommodate the lengthening and shortening of those surfaces of the glove in finger flexion. The folds may be at 90 degrees to the dorsal and palmar surfaces or angulated to the dorsal and palmar surfaces and may extend to the junctions of the dorsal and palmar surfaces or along the longitudinal axis of the medial and lateral surfaces. The accordion fold may be linear or curvilinear along to its longitudinal axis.

In alternate design IV of the flex point, a palmar tubule can be place behind the joint and a series of accordion folds are placed before it. The accordion folds are concave in shape and extend totally around the joint.

In alternate design V of the flex point, a flex point may extend from the palmar aspect of the joint as an expanding accordion fold which extends dorsally and distally away from the midpoint of the joint at an angle of 45 degrees. As the tubule moves further from the junction of

palmar medial and lateral surface, the tube widens. The broadening tubule's proximal fold makes an angle of 30 degrees with the distal edge of the straight tubule. A mirror image is found on the posterior edge of the straight tubule. This design may have a palmar surface tubule which is located just behind the flex point.

In alternate design VI of the flex point, the flex point is that of a figure eight. The upper and lower segments meet at the about the center of the joint on the medial and lateral surfaces. In an offset figure eight, in which the bottom portion of the figure may be in front of or behind the upper portion. An additional flex tubule may be placed behind the lower segment. All other characteristics of the flex point are of the preferred design.

In alternate design VII the accordion folds may be pressed back on themselves. The rational behind this is that more material can be gathered between the folds, which may decrease the number of folds necessary to have an adequate amount of material for joint expansion. It is important to understand that a sheet of nylon if pulled does not stretch to allow for lengthening or expansion. If the same sheet of nylon is gathered in folds, it will lengthen. If a series of folds are gathered in such a manor in which they are tapered to one point, the material will bend in an arc.

In alternate design VIII the flex point may include a combination of both concave and convex ribs, or solely concave or convex ribs may be utilized at the flex points of the glove. Their appearance would resemble that of a figure 8, with the meeting of each rib in about the center of the medial and lateral sides of each joint. An alternate figure 8 design can be used in which the figure 8 is offset with the lower segment placed before or after the upper segment. The dorsal ribbing is offset from the palmar ribbing, and a flex point tubule is placed behind the palmar ribbing. The purpose of the palmar tubule is to allow the compressed ribbing to get tucked out of the way so the surface can be

flatter so as not to interfere with instruments. The fold may be tucked inside the glove so that the outside surface of the glove is relatively smooth and that the area of the tucked folds will bulge slightly. A palmar tubule may also be utilized with the figure 8 design. With the dorsal and palmar tubules offset, the palmar tubule is located just behind the head of the phalanges or about the midpoint of the joint. The purpose for this is to allow for the shortening nylon to go somewhere. The tubule can be circular or another geometric form in shape. The ribbing as it folds upon itself will not bulge and the use of instruments is less encumbered. The hollow tubule or flex tubule located on the palmar surface may be adhered to the inner surface of the palmar surface in such a manner where the tube meets the surface and the adherence may be at either side of the circle, preferably, at the proximal portion of the circle, the circle modified to an oval and this would facilitate the ability of the tube to retract with the shortening of the palmar surface with finger flexion. The flex tube may be placed before the joint, as an alternative design if the flex tube behind the joint is unsatisfactory. An alternate design of the figure 8 design which allows for only a portion of the hand to lengthen while the contralateral portion remains intact. A combination of both concave and/or convex ribs may be used at the flex points of the glove, their appearance would resemble that of a figure 8, with the meeting of each rib in about the center of the medial and lateral sides of each flex point. Another alternate design is one in which the palmar flexion ribs are at full extension or almost full extension when the finger or hand is straight.

In alternate design I of the thumb, the interphalangeal joint of the thumb is the same as the proximal interphalangeal joints of the fingers. The range of motion of the thumb, as a whole, is unique. A second reason for this difference is that the thickness of the palmar surface is equivalent to that of the middle phalanx of the fingers.

The thickness of the material at the distal segment may cause need for additional flexibility. The metacarpophalangeal joint of the thumb has eight accordion folds. The first accordion fold is the same as the first fold of the interphalangeal joint. The second fold extends to the apex created by the first and the third fold, the straight fold. The next five folds, due to the uniqueness of the thumb's range of motion, begin at the apex on the web space of the thumb and index finger and arc eccentrically across the dorsum of the hand and end on themselves at a point short of the wrist.

In alternate design II of the thumb the interphalangeal joint has three accordion folds with the characteristics of the distal interphalangeal joints of the fingers. The metacarpophalangeal joint of the thumb has five accordion folds with the same characteristics as that of the proximal interphalangeal joints of the fingers. The metacarpal trapezium joint has three accordion folds. The first fold is angulated as in the preferred embodiments, the second is straight and circumscribes the joint, and the third is angulated and mimics the first fold.

In alternate design I of the metacarpal trapezium joint for the thumb, all the characteristics for the joint are as in the preferred design with the modification of the first straight fold. The fold ends on itself near its place of origin.

In alternate design II of the metacarpal trapezium joint for the thumb, all the characteristics for the joint are as in the preferred design with this modification. The point of origin of the folds may be adjacent or at the metacarpophalangeal joint folds.

In alternate design III of the metacarpal trapezium joint for the thumb, all the characteristics for the joint are as in the preferred design with modifications. All angles of the angulated tubules can vary from 45 degrees and also the number of eccentric arcing folds may vary.

The flex points for the alternate designs of the thumb should have the characteristics as the preferred design. The preferred and the two alternate designs of the thumb can have their apices located at the metacarpal trapezium joint. The eccentric folds extend from that point and rejoin at the web space or end on themselves.

In alternate design I of the metacarpophalangeal joint, the joint has eight accordion folds. All of their characteristics are that of the preferred design. The first three folds, the fifth fold, and the last three folds aie that of the preferred design. The fourth fold begins as a flex tubule at the first metacarpophalangeal joint. The fourth fold follows the same course as in the preferred design but ends on itself at the palmar surface of the web of the index and middle finger.

In alternate design II of the metacarpophalangeal joint, the joint has eight accordion folds. The design has all of the characteristics as that of the preferred design. The first three folds, the fifth fold, and the last three folds are that of the preferred design. In this design, the fourth fold does not end on itself, but rather ends as the middle fold of the web space of the index and middle fingers.

In alternate design III of the metacarpophalangeal joint, the joint has eight accordion folds. All of their characteristics are that of the preferred design. The first three folds, the fourth fold, and the last three folds are that of the preferred design. The fifth fold is the same as the straight fold of the proximal interphalangeal joint.

In alternate design IV of the metacarpophalangeal joint, the joint has eight accordion folds. All of their characteristics are that of the preferred design. The first three folds, and the last three folds are that of the preferred design. The fourth fold ends at or in the web space and the fifth fold circumscribes the joint.

In alternate design V of the metacarpophalangeal joint, the joint has eight accordion folds. All of their

characteristics are that of the preferred design. The first three folds, and the last three folds are that of the preferred design. The fourth and fifth folds mimic the third fold of the proximal interphalangeal joint.

In alternate design I of the web space accordion folds, the number and axis of folds may vary, including the web space between the thumb and index finger.

In an alternate design I of the accordion folds on the lateral aspect of the palm of the hand, the number and longitudinal axis of accordion folds can vary from the preferred design.

In an alternate design I of the accordion folds of the forearm; the number, location, and longitudinal axis of folds can vary.

In an alternate design I of the palmar tubules located on the palmar surface, the tubule may be adhered to the inner surface of the palmar surface in such a manner where the tube meets the surface and the adherence may be at either the proximal or distal portion (the beginning or the end) of the bell curve. Preferably, the adherence is at the proximal portion of the curve.

The flex tubule may be placed before the joint if the flex tube behind the joint is unsatisfactory.

The glove can be constructed with the palmar flexion ribs at full extension or almost full extension when the finger or hand is straight. This design could diminish any excessive misshaping of the glove.

An alternate design of the finger segment allows for an area of the joints wider than the phalangeal shaft portion of the finger. Anatomically, the joints are the widest portion of the finger and are wider than the shaft portion of the fingers. The flaring of the joint area should begin at about the proximal and distal third of the two phalanges which compromise a joint. The flare should be genteelly tapered and nonobtrusive. The flare can encompass all surfaces or any combination of surfaces of the finger joint. The same

type of flaring can occur at the level of the metacarpophalangeal joints. A second reason for this is that the fold of the flex point directed inward towards the operator's skin, after a long while, could become uncomfortable if the glove is tightly fitting. Since the depressed portion of the film is 1/16th", greater comfort can be had by the operator. All thicknesses after the taper are not sharp to include that of the flex point. Those surfaces include all surfaces of the segment.

An alternate design may increase flexibility. The joint may have the accordion folds embossed along the outside surface of the medial, lateral and dorsal surfaces. The height of the folds are approximately 1/16". If the folds are not located at the joint level, they may be placed before or after the joint along the medial and lateral surfaces of the fingers and hand to accommodate the lengthening and shortening of those surfaces. The folds may be used in conjunction with the flex point and/or wedge designs. The longitudinal axis of the folds may be at 90 degrees or less to the dorsal and palmar surfaces, and they may be linear or curvilinear. The design would allow for the flexion necessary to flex a finger, however the design may interfere with instrument use. The accordion folds may press back on themselves. The rationale behind this is that more material can be gathered between the folds, which in turn may decrease the number of folds necessary to have an adequate amount of material for joint expansion. It is important to understand that a sheet of nylon, when pulled, does not stretch to allow for lengthening or expansion. If the same sheet of nylon is gathered in folds, the sheet lengthens. If a series of folds are gathered in such a manner that they are tapered to one point, the material bends in an arc.

The palmar surface of the glove in the preferred embodiments is contoured. An alternate embodiment of the surface is to have it appear flat. Another feature which can be incorporated into the design is to have the surfaces of

the fingers and palm mimic that of a hand. Surfaces of the glove are concave and convex where appropriate, rather than being that of a flat surface.

The solid material may be adhered to another material by any means including friction.

The pads located at the distal. phalanges of the fingers can include other materials which will increase the tactile sensation while reducing puncture resistance. An example is latex. The pads can be comprised of a soft material such as polypropylene, which does not have as great puncture resistance as that of nylon, but its puncture resistance may be greater than that of latex. When the pad design is incorporated in the glove, it is ovoid in shape. The design may or may not cover the entire palmar phalangeal surface of the glove. A different geometric pad design can be utilized. This design may or may not cover the entire surface of the distal segment of the glove. The preferred design is ovoid and embossed with a design to improve tactile sensation along with improving gripping ability. In alternate design I of the ovoid area, the area has .007" or less of cut and puncture resistant material and the entire distal palmar phalangeal segment is embossed with a design to improve gripping ability. The finger pad area can be composed of another material, ovoid in shape, which does not extend over the entire palmar surface of the finger. The balance of the flexion area of the palmar surface of the distal segment would be that of nylon. The material substituted for the nylon provides about the same cut and puncture resistance as that of nylon and has greater flexibility. This design allows for the distal segment to be of increased thickness than the preferred design. The ovoid area of the tactile pad of the finger is of a thinner material. This provides greater puncture resistance to the distal segment of the finger and the area of tactile sensation is not compromised.

An alternative design of the glove uses the same cut and puncture resistant layer of the mesh as Seid used, and

embosses the flex point and/or wedge design into the mesh. The mesh can be increased in thickness as one moves proximally away from the distal phalanx and can incorporate the flex design and/or the stepped wedge design. The flex point area can be fused by simply phenol or heat application and pressure embossing. The advantages of this is that the glove has greater flexibility and cut and puncture resistance, and the ribbing on the dorsal surface is not as great or is eliminated if the dorsal surface is of another material of greater flexibility other than nylon. Less attention needs to be directed at the designs of the dorsal, medial and lateral surfaces of the glove because the use of latex, a very flexible material, is used. If the mesh were to incorporate the medial and/or lateral surfaces, then a flex point design which would accommodate to the nylon material may be necessary. The major disadvantage of this method is that the nylon layer would not be impervious to liquids and must be sealed by another material, whereas in the present invention, no additional film is necessary to create a body fluid barrier.

An alternate design of the glove uses the palmar surface of the glove or any other surface of the glove, embosses the flex tubule and/or wedge design and adhere it by any means to a latex glove including friction. Any other surfaces of the invention may be added or substituted for the palmar surface. Any of the preferred designs, any and all designs of this invention, may be incorporated into this glove. In this instance, the preferred material of the ovoid area of the distal segment may be substituted with latex.

An additional unique feature of the present invention is the stepped thickness of the materials. The Fibanacci relationship is maintained to provide the maximum mechanical advantage. In one instance, the distal phalanx is 50% in thickness of the middle phalanx, the middle phalanx is 66% in thickness of the proximal phalanx, and the proximal phalanx is 60% as thick as the palmar surface. The increasing in the

thickness of the material follows a mathematical progression. As on moves from the finger tip towards the palm the next segmental thickness is arrived by adding the preceding two thicknesses; in essence, a Fibanacci relationship. The wedge design gives mechanical advantage to the distal portion of the finger which in turn gives the distal segment of the finger the mechanical advantage to help push the material on itself so that the compensation for the shortening can occur at the flex point. The point where the thickness of the material increases acts as a hinge or fulcrum so that the more distal portion of the finger is more easily flexed. The wedge may also take the shape of a tapered wedge, rather than a step down wedge. In that design, the thickness of the material is constantly decreasing from its thickest to thinnest point. The median phalangeal thickness of the tapered wedge should approximate the thickness of the preferred design.

The preferred design is one in which the thickness differential is that of a tapered stepped design, whereby the taper occurs at the flex tubule. In the stepped design, it is possible to have a tapered form located at the step. The design can be of a solid film or material which may be of geometric shape or portion of a geometric shape, for example a solid 1/4 round circle or an arc. A stiffer material may be embedded into the thicker segment as the step down or as the filler in the geometric shape to increase the ability of the material to act as a fulcrum on itself in the flexion and extension motion.

The wedge design is the driver to provide maximum mechanical advantage and user functionality. Wedge thickness ratios are based on the films employed and derive so as to provide maximum resistance to punctures, cuts and infusions of liquids, chemicals or biological agents. Thus the ease of flexion of the finger, with a stiff material is improved. The outer surface of the glove is smooth and variations in thickness occur along the inner surface of the glove.

An alternate design is to have a reverse wedge design on the dorsum of the glove which follows the mathematical sequence in which the finger tip area is the thickest and the wrist area is the thinnest, the reverse of the palmar wedge.

An alternate design of the medial and lateral surfaces of the fingers and hand may have the wedge design.

The combination of the wedge and flex point design both aid in the flexion mechanism.

The preferred method is that of hermetically sealing or air evacuation of the films.

There is an advantage to applying a film which is resistant to reactive chemicals. If the chemical resistant film were flexible and soft, the film would act to aid in the puncture resistance enhancement of the primary puncture resistant material. If a thin film of acrylic is the chemical resistant film and is applied to the puncture resistant film, the acrylic film is very soft and very flexible. When a metal instrument violates the film, the film slows the speed of the object and provides, as a result, greater puncture resistance.

More than one area of the glove may have non slip gripping patterns adhered, embossed or ingrained within its film. The inside design of the glove may be altered so that a design may be imparted to its surface to facilitate hand insertion. The design may be of full thickness or partial thickness of one or more films of the glove. A film or coating can be applied to the inner and/or outer surface of the glove which will protect the operator's hand from reactive chemicals. The film may or may not be adhered to the nylon inner surface of the glove. If adhered, the adherence may be by any means including friction.

A material may be applied to the exterior surface of the glove or a pattern may be embossed into the surface or shaped within the surface of the glove to increase the friction co-efficient of the glove to increase the gripping ability of the operator. The inside surface of the glove can have an

embossed design of full or partial thickness or a material applied to its surface to facilitate hand insertion.

The preferred embodiment of the present invention is based on a distinctive set of mathematical relationships. The accordion folds of the dorsum of the hand are three at the distal interphalangeal joint and the interphalangeal joint of the thumb, five at the proximal interphalangeal joint and the metacarpophalangeal joint of the thumb, eight at the metacarpophalangeal joints of the fingers and the metacarpal trapezium joint of the thumb, and thirteen at the wrist. The palmar flex tubules are one, one, two (or one), and three Grey's Anatomy, which describes three creases at the wrist. There is one straight accordion fold for the distal interphalangeal joints of the fingers and the interphalangeal joint of the thumb. One straight accordion fold for the proximal interphalangeal joints of the fingers and for the metacarpophalangeal joint of the thumb, two straight accordion folds for the metacarpophalangeal joints of the fingers and for the metacarpal trapezium joint of the thumb, and three for the wrist. There are three accordion fold for the web spaces, five for the medial surface of the palm and eight for the forearm. The diameter of the flex tubules are 1/16th", 1/16th", 2/16th", and 3/16th", respectively. The wedge shows a relationship of one thickness, two thicknesses, three thicknesses and five thicknesses. When this is done, there is a significant increase in the amount of sharps protective material and the slight angulation of about one degree is relatively imperceptible to the operator, but gives a mechanical advantage to the ability for one to flex the film. The preferred design geometric figure is the bell curve and has three points on which it can move on itself or flex. The design contains one, two, or three means of preventing body fluid and infectious disease particulate material from coming into contact with the operator's skin. The preferred method of constructing the glove is in the organized, effective

mathematical sequence format. The following are Fibanacci numbers: 0,1,1,2,3,5,8,13. The Fibanacci number sequence is adding the first two numbers to derive the third. All preferred designs of the glove are Fibanacci numbers and Fibanacci number sequences.

The packaging of the gloves may be color coded as to the size of the glove along with printing the size on the package. This system gives users greater ease in locating the proper size. The size of the glove can be stamped with non-toxic materials on the glove itself in the proper color for its size.

Alternate means of producing the glove's design can vary from the preferred in a manner in which any and/or all of the accordion folds, flex tubules, number of straps, and thicknesses of the material are altered.

The preferred glove can be manufactured by a number of methods, including the use of melted or molten material, the use of the material in sheet form, and vacuum forming.

If the glove is to be produced via the melted format, the material is either poured or injected into a two piece mold of the palmar surface which has all design features incorporated into the mold. The melted material is, either poured or injected in a second two piece mold. This mold contains all the design features of the dorsal, medial, and lateral surfaces of the glove. Each two piece mold set provides a positive and negative mold. The molten material is inserted between the positive and negative mold halves. Pressure is applied and the resultant is allowed to cool. The next step requires a full positive mold of the full hand, both formed halves of the glove are placed on the mold, the parts are aligned, fused, and the excess material removed.

If the manufacturing of the glove is to be done with a sheet of the material, six cutting dies, a two piece mold of the palmar surface of the glove, a two piece mold of the medial, lateral, and dorsal surfaces of the glove, and one positive mold of the entire hand are needed.

A cutting die cuts the sheet of material, which is .007" in thickness, in the shape of the palmar surface of the glove. A second die cuts a sheet of the material .007" in thickness, in the shape of the palmar surface of the glove and which in this case the cut ends at the distal interphalangeal joint and the interphalangeal joint of the thumb. A third die cuts a sheet of material .007" in thickness in the shape of the palmar surface of the glove which in this case, ends at the proximal interphalangeal joint of the fingers and the metacarpophalangeal joint of the thumb. A fourth die cuts a sheet of the material .014" in thickness in the shape of the palmar surface of the glove which, in this case, ends at the metacarpophalangeal joints of the fingers and the thenar eminence of the palm. A fifth die cuts the material .020" in thickness in the shape of the forearm which, in this case, ends at the wrist. A sixth die cuts the material .028" in thickness in the shape of the forearm which in this case ends at the wrist. The films are aligned in the proper thickness sequence on the negative mold of the palmar surface of the glove which contains the designs. Heat and pressure shaping are gradually applied to the mold. The resultant is a solid film of varying thickness embossed with the preferred design. During the forming process, heat and pressure must be applied gradually. The cooling process must also be gradual to avoid distortion. The films are placed in a negative mold of the dorsal, medial and lateral surfaces which contain the preferred designs of each surface. The same process for the palmar surface is used. The result is a glove having a solid film of varied thickness. An alternative means of producing the glove from the solid sheet of material is to substitute a bonding agent instead of heating the material. Again, the bonding process, embossing process, and cooling process should be done gradually to avoid distortion of the design. Both halves are placed on a positive of a hand, aligned, fused and trimmed.

The strap and locking seal could be adhered to the glove

following either process with either glue or welding. The soft pliable conforming inner seal of the strap would then be applied to the inner surface of the forearm. The preferred glove is now complete.

The preferred film is an oriented polymer, nylon. The preferred material, nylon may be combined with or substituted with polymers, co-polymers, resins, aramids, Fiberglas, acrylics, cyanoacrylics, ceramics, carbon fiber, salts, metals, composite materials, elastomers and other puncture resistant materials. The material may take shape or form as a single homogeneous film or a blend of materials. Oriented films provide increased strength. Monoaxial oriented film is preferred. The desired quality of increased strength is found with oriented films over other polymer or nylon films. Film orientation is achieved by the following means. A film is extruded and the extruded film is then heated and pulled to orient. A cast film is formed and then heated and pulled to orient. An extruded film is heated, rolled, and pulled to orient. A molten polymer is injection molded into a narrow passage or cavity. Other means of producing oriented films and laminates may be used.

The preferred film sheets allow for the glove to be constructed in two pieces with a seam created at the point where the two films are joined. The preferred film, when injection molded, allows for the glove to be formed as a one piece glove.

A single thickness layer of the preferred material can be used for construction of the glove. A glove of a single thickness layer of the film may be used since the film is a solid sharps resistive barrier resistive to bloodborne pathogens. In this case, the flex point and wedge designs may or may not be imparted to the film. A single thickness layer of the oriented film may be adhered to a latex glove with or without the flex point and wedge designs. Adherence to the latex glove includes friction. The single thickness glove is constructed as a one or a two piece glove. In this

case, the glove would be sloppy and not as suitable for surgeons. An oriented glove without the imprinted designs could be used as an examination glove.

The palmar surface can be constructed of a single thickness layer of the preferred film with or without the wedge design. The palmar surface can be adhered to a latex surgical glove. Adherence to the latex glove includes friction. The benefit of this design allows for increased sharps protection to the palmar surface of the hand without incurring the additional expense of having additional layers applied. The single layer of oriented film may or may not have the palmar flex tubule or wedge designs. The wedge design alone provides sharps protection. This design can be adhered to latex gloves and provide greater sharps protection in areas of the hand not critical to tactile sensation. In this design, the wedge can be constructed with or without the palmar flex tubule.

An injection mold is constructed with the flex point and the wedge designs. An injection mold process may be used to produce the oriented glove. In this instance, a sharps resistant material or nylon is used as the basis of the oriented film. This design is possible due to the flex point and wedge designs. The flex point and/or wedge design allow films to flex and extend with normal hand function. The flex point and/or wedge design allow previously unused sharps resistive materials to be used. The wedge design may be created via an injection mold technique known as a two shot process. In this case either design will provide sharps resistance. The injection mold process allows any polymer to be used as the sharps resistive material. The resultant oriented glove will function due to the flex point and/or wedge design of the glove.

The wedge design may be incorporated by adhering oriented films to the palmar surface of a single thickness glove without the flex point design. Following the adherence of the wedge design, the glove is placed in a mold that

contains the flex point design. Heat and pressure are applied and the resultant glove has the preferred designs.

The flex point and /or wedge design can be used with other processes for glove construction since both designs, whether independently or in combination, improve glove function.

When producing a thin film glove by the injection mold process, the molten polymer is required to pass through small passages. As a result, the film of the injection mold process is oriented.

A mold for a single thickness glove is constructed for injection molding. Additional layers of oriented film are adhered to the palmar surface. The oriented glove is then placed in a mold with the flex point and/or wedge design. Heat and pressure are applied. The preferred glove is formed.

A mold for a single thickness glove is constructed for injection molding. The oriented glove is placed on a mold that contains the flex point design. Heat and pressure are applied to the glove. The glove will take and retain the flex point design.

A mold for a multithickness palmar surface and single thickness for the balance of a glove is constructed for injection molding. The oriented glove has the wedge design. The glove is then placed on a mold with the flex point design. Heat and pressure are applied to the glove. The resultant is the preferred glove.

Dartek is an oriented sheet film produced by DuPont. Dymetrol produces oriented nylon and polymer strapping. Either of these can be used as the oriented film of the glove. Either product has the sharps resistive qualities that are desired. In addition to the sharps resistive properties, their products have adequate tactile sensitivity at the fingertip level. The tactile sensitivity required at the fingertip level varies by application

An oriented sheet film is created in the following

manner. Filaments of the preferred material are extruded via normal extrusion techniques. In this case, the die has apertures that are triangular in shape rather than the standard circular shape. The triangles are equilateral triangles. A cross cut die can be used to create the triangles. The extruded monoaxial filaments are then placed adjacent to one another with the long axis of each filament parallel. The filaments are then placed on a sheet of 1.5 mil thick oriented film. The machine direction of the film is in the same direction as that of the oriented filaments. The filaments and oriented film are bonded or laminated to one another via heat, chemicals or any other means. The resultant oriented film is one thickness with a geometric pattern or portion of a geometric pattern on one surface. The film is solid, nonporous and has sharps resistive properties. The film is approximately half the preferred thickness desired. To develop an oriented film of the desired thickness, it is necessary to produce a laminate of two sheets of the film. The films are bonded or laminated together by any means, with the apices of the triangles offset so that the resultant oriented film is of the desired thickness and is smooth on all surfaces. Preferably, a low density oriented film is used to produce the laminate. The laminate of the preferred material has the qualities that are desired for sharps resistance and tactile sensitivity. Imprinting the designs of the glove in the film improves flexibility and hand function.

In another means of producing the oriented film, one can extrude a film that is I mil or greater in thickness. One surface of the film contains the equilateral triangle design. The film is then pulled and heated to achieve orientation. A second sheet of the film is then placed on the first. The films are bonded or laminated together by any means with the apex of each triangle offset so that the resultant oriented film is of the desired thickness and is smooth on all surfaces. In using the preceding processes to develop an

oriented film, it is possible to develop films of greater thickness than present processes. The monoaxial orientation of the film is maintained and the important quality of the film, resistance to sharp objects preserved.

In one preferred form of the invention, the oriented glove and attached suit are formed out of one uniform sheet of the oriented nylon about 6 mils thick. The thickness of the sheet may be varied to accommodate the particular needs of the user. The two halves of the glove and suit are united as described in the preceding sections. The gloves may be united as previously described and the suit may be sewn together at the seams. The seams of the suit are reinforced with additional strips of oriented film. The reinforcement is bonded or adhered to the suit via any means. Reinforcement of the seam provides additional sharps protection and additional protection against splitting the suit with movement. The suit includes a hood with portals for a visor and the attachment of respiratory apparatus. Accordion folds are place in the joint areas to facilitate and allow for ease of motion. This design provides for maximum protection to the operator. The soles of the boots may be constructed of a thicker oriented film. The one piece suit unit provides protection against infective materials through direct contact, liquid spills and airborne transmission. The one piece unit provides sharps and tear resistance protection to the operator. Side panels of the same accordion fold design are incorporated in the body of the suit to provide for side to side and rotational movement of the torso. Additional films or coatings may be applied or adhered to the uniform glove and suit to provide additional protective qualities such as additional chemical resistance.

Alternate design I. Of the suit is without accordion folds.

Alternate design II. Of the suit is to construct the suit as a gown. In this design, the suit does not have legs. In this design it is not necessary to have the gloves

attached. In this design, some or none of the accordion folds of the suit are present.

Alternate design III. Of the suit is to construct the suit as a gown. In this design, the suit does not have legs. In this design, some or none of the accordion folds of the suit are present.

Alternate design IV. Of the suit is without the gloves attached.

To provide maximum protection to the operator, it is necessary for the glove to be attached to the suit. The gloves may be attached by any means. The preferred means of attaching the gloves to the suit is with a two piece mechanism, the peg lock. The peg lock's compression system allows for the gloves and suit to be removed as a one piece unit. The peg lock allows the operator to remove the one piece unit and prevent self contamination. If the operator desires to remove the gloves, the tab of the glove is lifted and the compression fitting system springs open. In the preferred mechanism, a seal or gasket is applied to closure piece attached to the glove. The gasket provides a liquid, chemical and vapor barrier. Coatings or films may be applied to the peg lock to provide additional chemical protection. The two piece unit snaps together to form the attachment mechanism. The appearance of an engaged peg lock system is ovoid. That appearance may vary according to different embodiments of the peg lock and the present invention. Width and height of the oval is determined by glove size. The diameter of the engaged system is adequate for the operator to slip over their hand yet small enough to not interfere with one's work. The peg lock is constructed from plastic. The peg lock is injection molded. Flexible materials of the peg lock may be substituted for plastic.

A three piece taper lock attachment mechanism can be used to attach the glove to the suit. In this case, both the suit and gloves have attached plastic pieces that insert into a collar that slides over the hand onto the forearm. In a

variation, the components of the taper lock are slid the glove and suit of the operator and assembled. The taper sleeve of the glove and the "O" ring of the suit are then connected to the taper lock. The taper lock allows for the glove and gown to be removed as a one piece unit and allow the operator to remove the glove if desired. An additional safety lock can be incorporated into the taper lock to provide an additional means of securing the glove to the suit. Additional films or coatings may be applied to each portion of the taper lock to provide additional chemical protection to the operator. A gasket may applied to the taper lock to provide additional liquid and vapor. The appearance of an engaged taper lock is ovoid. Width and height of the oval is determined by glove size. The diameter of the engaged system is adequate for the operator to slip over their hand yet small enough to not interfere with one's work. The taper lock is constructed from plastic. The taper lock is injection molded. Flexible materials of the taper lock may be substituted for plastic.

While the invention has been described with reference to specific embodiments, modifications and variations of the invention may be constructed without departing from the scope of the invention, which is defined in the following claims.

I Claim:

1. A surgical or examination glove comprising connected palm, fingers, thumb, wrist and forearm portions having palmar, medial, lateral and dorsal surfaces comprising a layer of film impervious to body fluids and being cut and puncture resistant, the glove having palmar distal phalangeal finger segments with a thickness less than a thickness of the rest of the palmar surface of the glove, palmar middle phalangeal finger segments of the glove having a thickness more than the thickness of the palmar distal phalangeal finger segments and equal to a thickness of a palmar distal phalangeal thumb segment, palmar proximal phalangeal finger segments of the glove having a thickness similar to a thickness of a palmar proximal phalangeal thumb segment, a thenar portion of the palm and a palmar segment of the palm having a thickness greater than a thickness of the palmar proximal phalangeal finger segments, and a forearm segment having a thickness greater than a thickness of the rest of the glove, the most distal segments of the palmar surface of the fingers being thinner than the palmar middle segments and having a thickness not greater than thicknesses of the medial, lateral and dorsal surfaces of the glove, and the palmar surface having an increasing thickness in a direction extending from the distal phalangeal segments to the forearm.

2. The glove of claim 1, further comprising a palmar side of each of the portions and a dorsum of each of the portions, wherein the palmar side has parallel spaced single grooves to allow and facilitate flexion, and wherein the dorsum has plural spaced accordion folds for allowing expansion of the dorsum of the glove longitudinally between the wrist portion and the distal finger portions and for providing concave arcing of the front of the finger, thumb, palm, and wrist portions for providing adequate tactile sensation and flexibility at the distal segments, wherein each segment is adhered to an adjacent segment, and the wrist is adhered to the forearm portion.

3. The glove of claim 1, wherein the glove comprises moldable materials and is adaptable to individual users.

4. The glove of claim 1, wherein varied glove thicknesses of the glove portions provide for the puncture resistance, and the glove having a flex point design allowing for greater thickness of the cut and puncture resistant film in portions of the glove not needed for tactile sensation.

5. The glove of claim 1, further comprising molded flex areas having a surface coating for providing increased gripping ability due to friction without compromising tactile sensitivity.

6. The glove of claim 1, further comprising molded flex areas for providing improved flexibility and for allowing molding of the glove with a solid film impervious to body fluid and having an improved cut and puncture resistance.

7. The glove of claim 1, wherein the film is a single thickness fluid resistant film having a flex point, and wherein the film has a pre-determined varied thickness corresponding to the varied thicknesses of the glove portions for forming the glove.

8. The glove of claim 1, further comprising the palmar surface of the glove being adhered to a latex glove, the palmar surface being of a single layer solid film resistant to cuts and punctures.

9. The glove of claim 1, further comprising a flexible material attached to an inner surface of the glove forming a strap for tightening the glove and providing a tight seal to prevent fluids from entering within the glove when in use.

10. The glove of claim 9, further comprising an additional strap provided on the forearm portion for attaching to a suit of a user and sealing an area around the strap for preventing extraneous matter from entering the glove when in use, said sealing allowing for removal of the user's suit along with the gloves and preventing contact with any material being handled when the glove is in use.

11. The glove of claim 1, wherein the glove is a surgical glove having variable thicknesses and flexion.

12. The glove of claim 1, wherein the glove is a multipurpose glove having variable thicknesses and flexion.

13. A sharps protective glove comprising fingers, thumb, palm, back, and wrist sections and having a layer of oriented nylon on palmar surfaces of the fingers, thumb, palm, and wrist sections.

14. The sharps resistant glove of claim 13, further comprising a protective suit made of oriented nylon sealed at the wrist.

15. A sharps resistant glove comprising fingers, thumb, palm, back, and wrist sections constructed of oriented nylon.

16. The sharps resistant glove of claim 15 further comprising flex points formed at fingers, thumb, palm, and wrist joints.

17. A sharps protective glove and suit combination comprising a suit attachable to a glove, said suit and glove being formed of oriented film, said combination providing for insulation of a user from all extraneous material.

18. The combination of claim 17, wherein the oriented film is one uniform sheet forming the suit and the glove.

19. The combination of claim 18, wherein the sheet has varied thicknesses.

20. The combination of claim 17, further comprising the suit having seams with reinforcements formed of additional oriented film for providing additional sharps protection.

21. The combination of claim 17, further comprising the suit having a hood, said hood having openings to accommodate plural attachments.

22. The combination of claim 17, wherein the attachments comprise a visor and a respiratory apparatus.

23. The combination of claim 17, wherein the suit further comprises plural accordion folds along joint areas to allow and to facilitate ease of motions by an user.

24. The combination of claim 17, wherein the glove

comprises fingers, thumb, palm, back, and wrist sections.

25. The combination of claim 24, wherein the glove has a layer of oriented nylon on palmar surfaces of the fingers, thumb, palm, and wrist sections.

26. The combination of claim 25, wherein the suit is sealed at wrist sections.

27. The combination of claim 17, the glove further comprising flex points formed at fingers, thumb, palm, and wrist joints.

28. The combination of claim 17, where the suit is selected from the group consisting of a gown having no legs or an outfit having a torso and legs attached to the torso.

29. A glove comprising fingers, thumb, palm, back, and wrist sections, and a lock for attaching the glove to a suit.

30. The glove of claim 29, wherein the lock is a peg lock formed as a compression system for attaching the glove to the suit and for removing the glove and the suit as one unit.

31. The glove of claim 30, wherein the peg lock comprises a seal for snap-fitting in a complementary groove provided in the suit to hold the glove in a sealed relationship with the suit and to prevent outside matter from contacting a user.

32. The glove of claim 30, wherein the peg lock is injection molded.

33. The glove of claim 30, wherein the peg lock is of plastic material.

34. The glove of claim 30, wherein the peg lock is of flexible material.

35. The glove of claim 29, wherein the lock is a taper lock.

36. The glove of claim 35, wherein the taper lock is formed as a collar having plural receivers, and wherein the glove and the gown comprise connectors for inter-fitting in the receivers and for connecting the taper lock to the glove and the suit for removing the glove and the suit as a one-

piece unit.

37. The glove of claim 36, wherein the collar is slidably inserted on the glove and the suit for connecting the glove and the suit and for insulating a user against all extraneous matter.

38. The glove of claim 36, wherein the connectors are plastic pieces for connecting to the receivers.

39. The glove of claim 36, wherein the connectors are O-rings.

40. The glove of claim 29, wherein the lock is detachable for allowing the glove to be separated from the suit.

41. The glove of claim 35, wherein the taper lock further comprises a safety lock for securing the glove to the suit.

42. The glove of claim 35, wherein the taper lock is injection molded.

43. The glove of claim 35, wherein the taper lock is of plastic material.

44. The glove of claim 35, wherein the taper lock is of flexible material.

45. The glove of claim 29, further comprising the glove and lock being of oriented material.

46. The glove of claim 45, further comprising coatings on the glove and on the lock.

47. A glove comprising fingers, thumb, palm, back, and wrist sections having flex point design for allowing flexing and ease of movement when the glove is in use.

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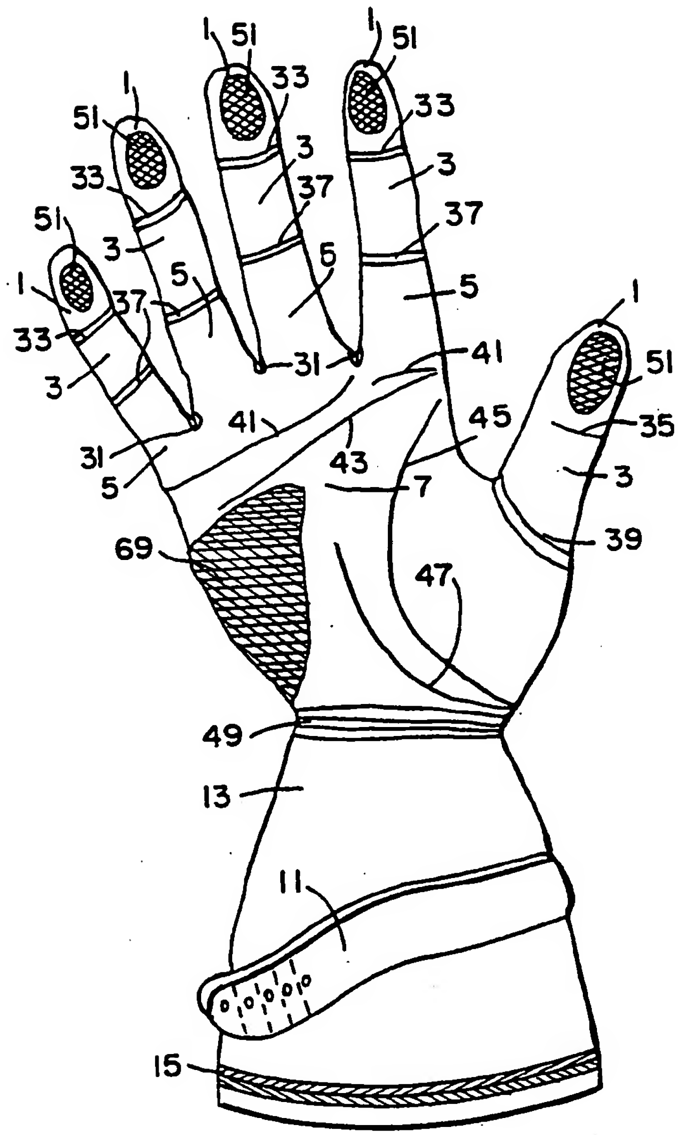

FIG. 1

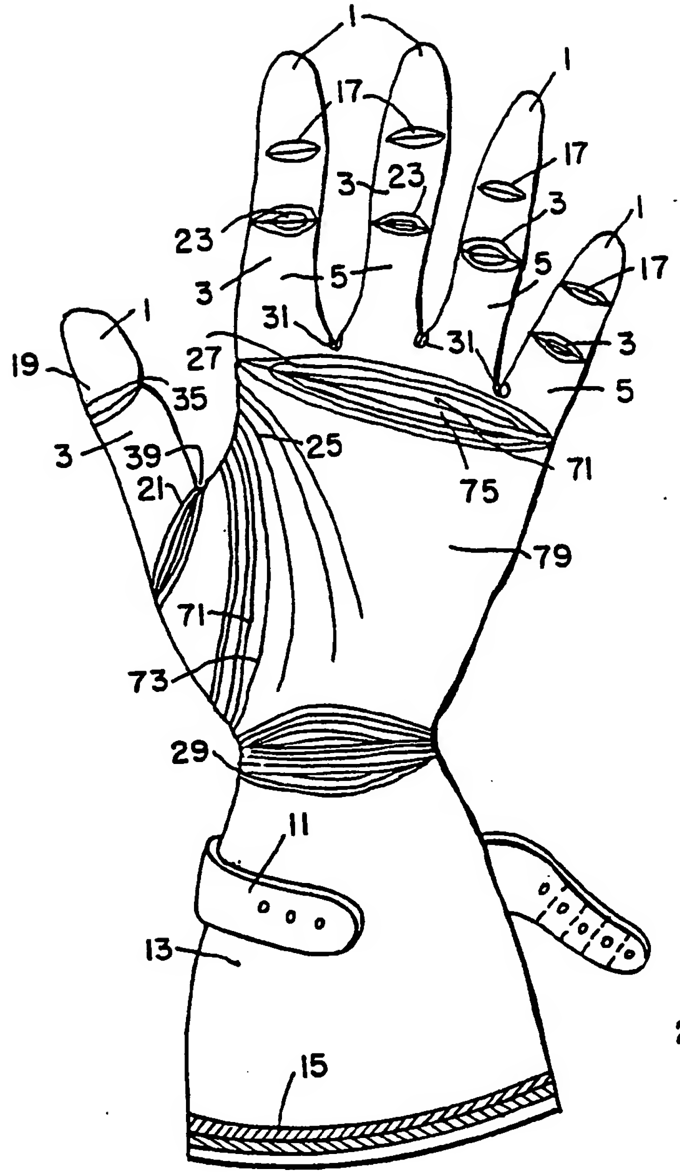
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FIG. 2

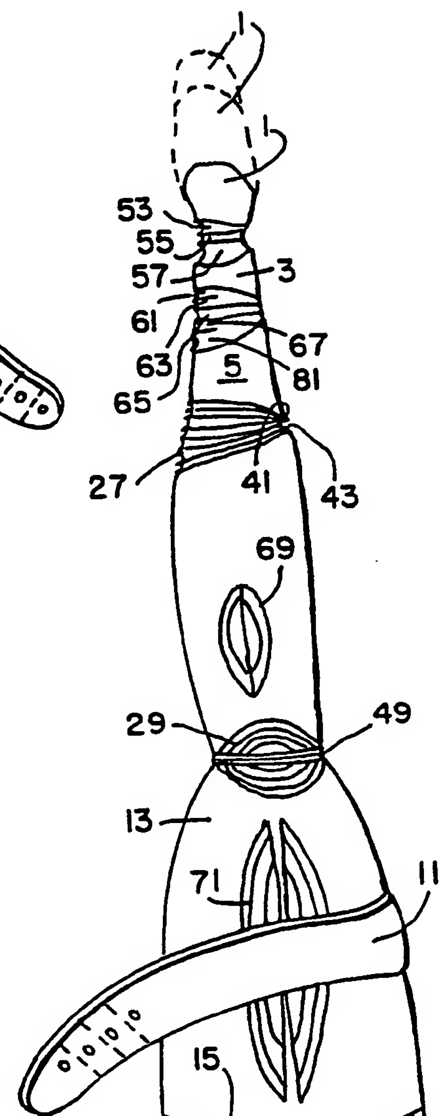
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FIG. 3

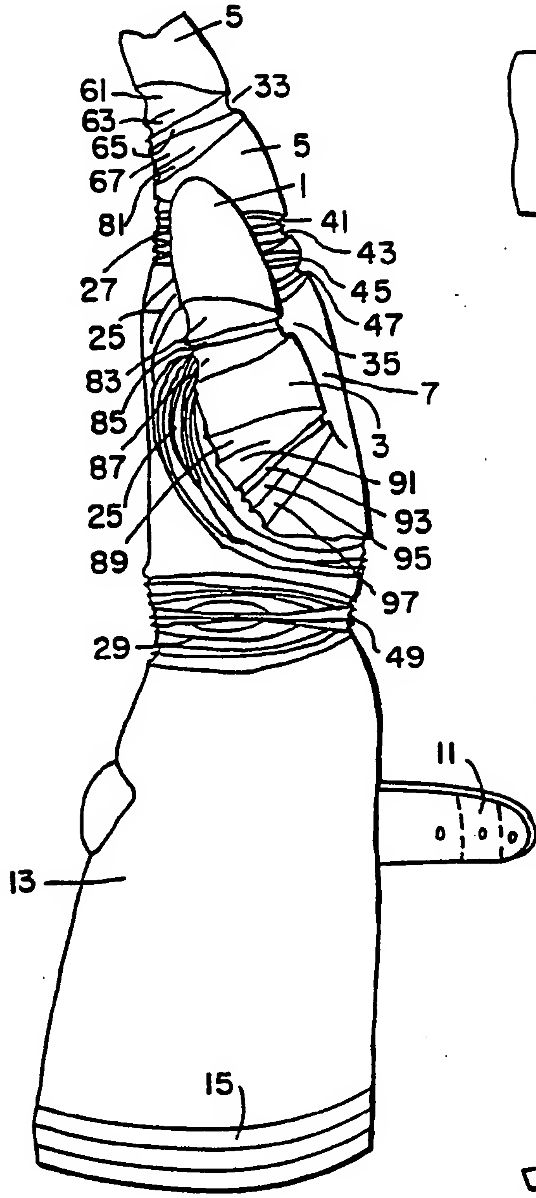

FIG. 4

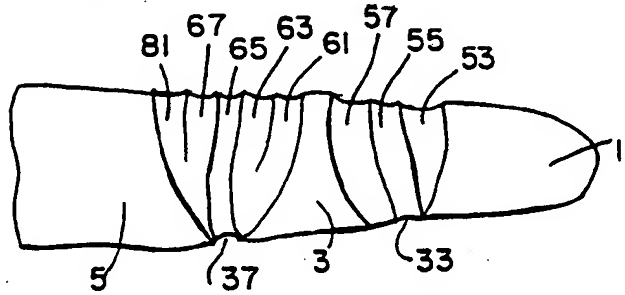

FIG. 5A

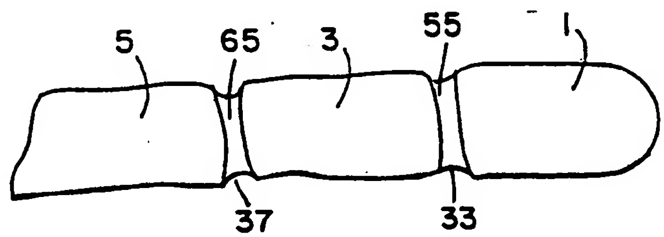

FIG. 5B

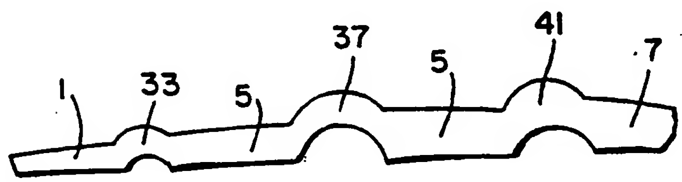

FIG. 5C

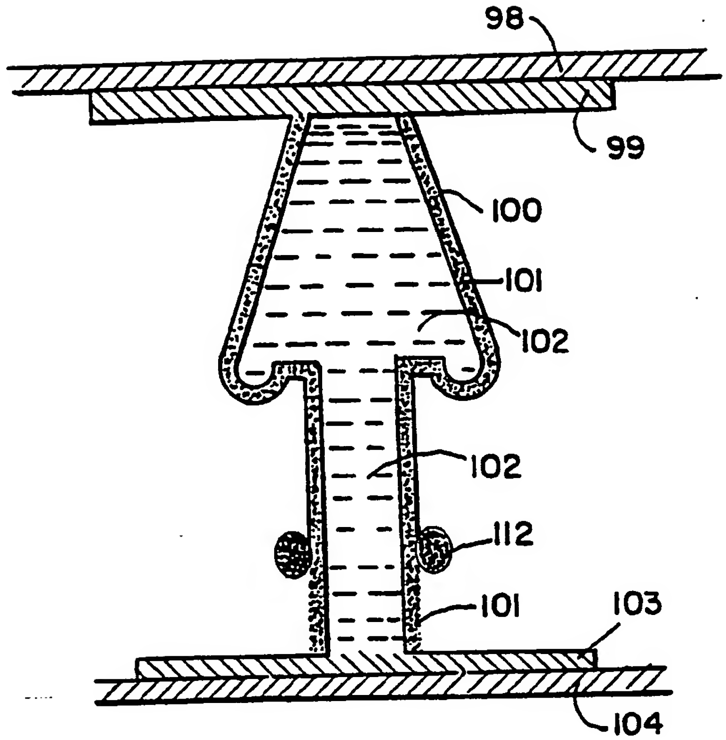

FIG. 6

FIG. 8

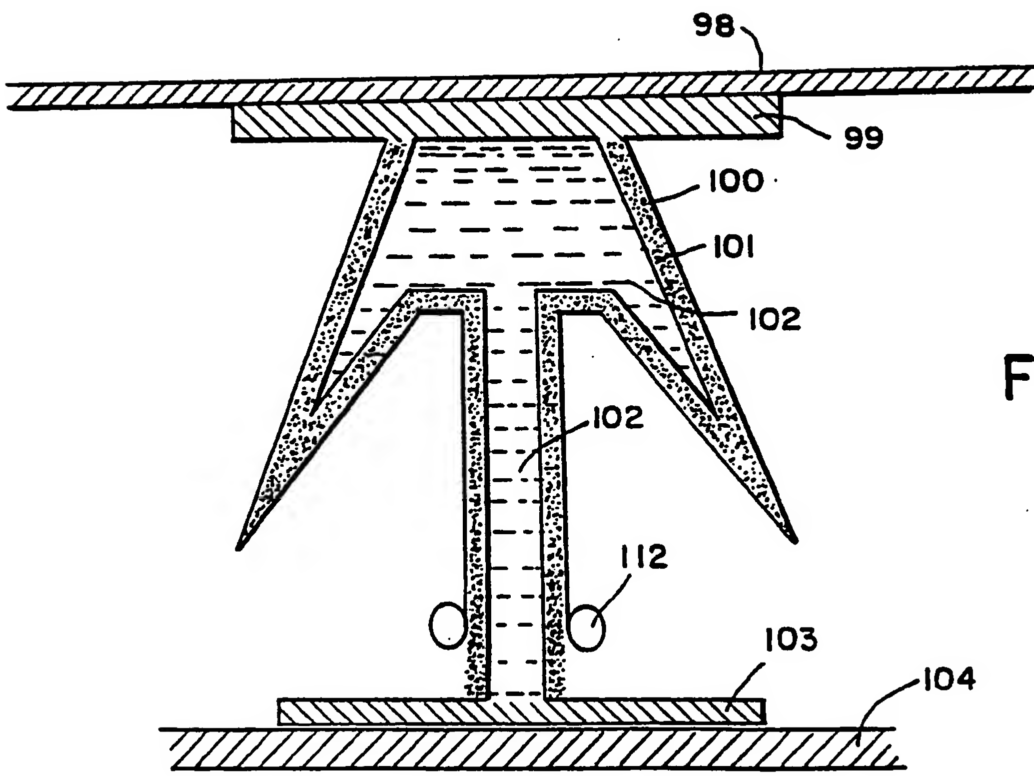

FIG. 7

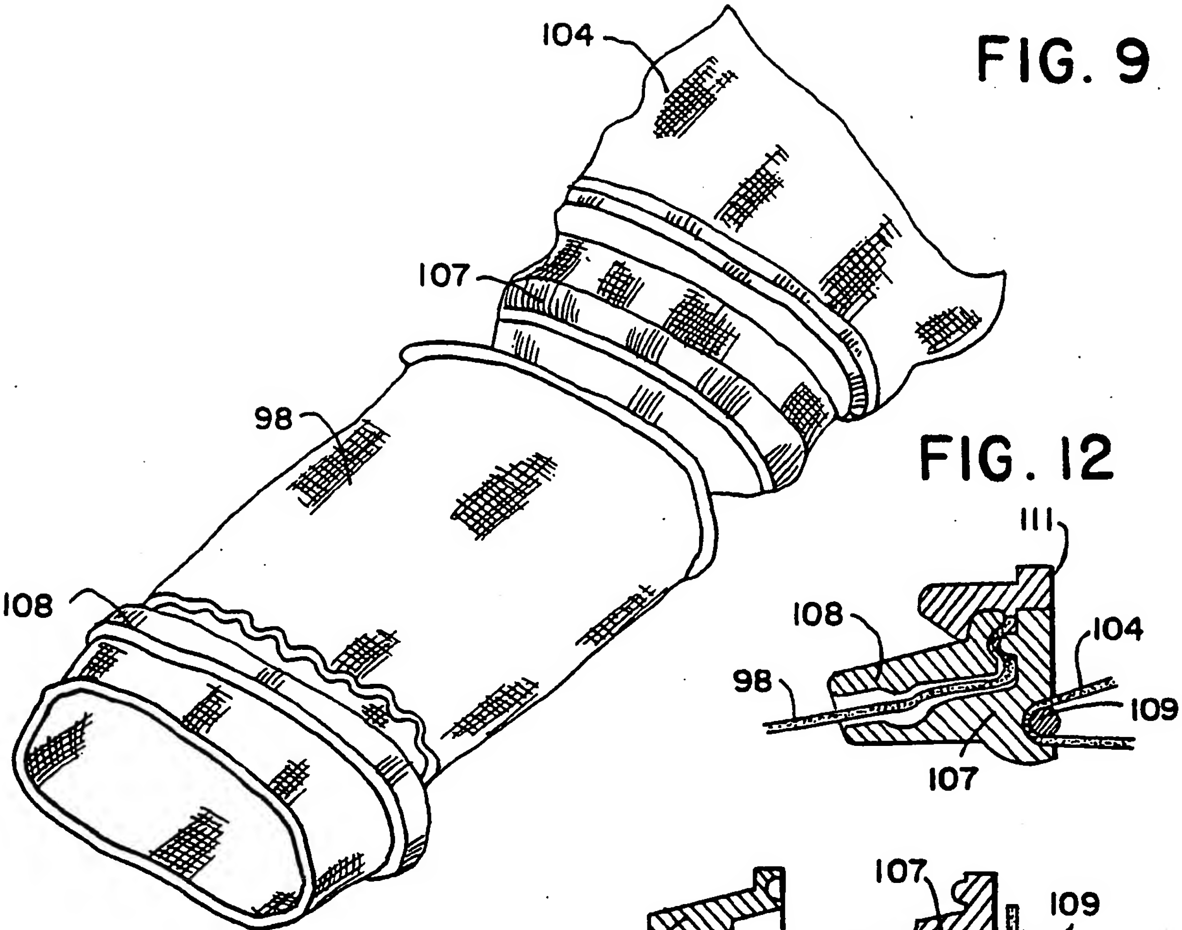

FIG. 9

FIG. 12

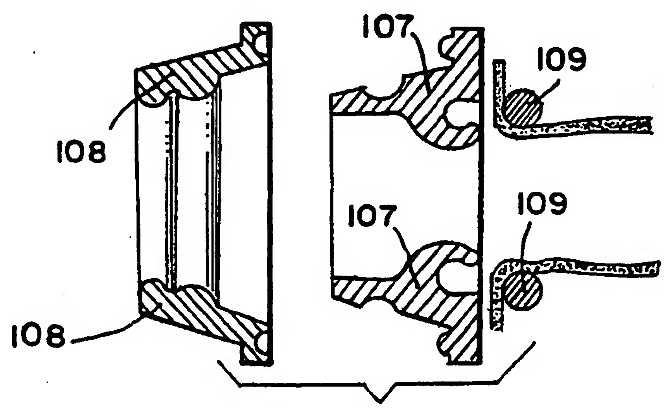

FIG. 10

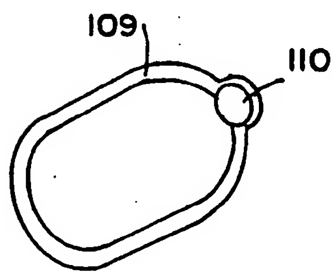

FIG. 11

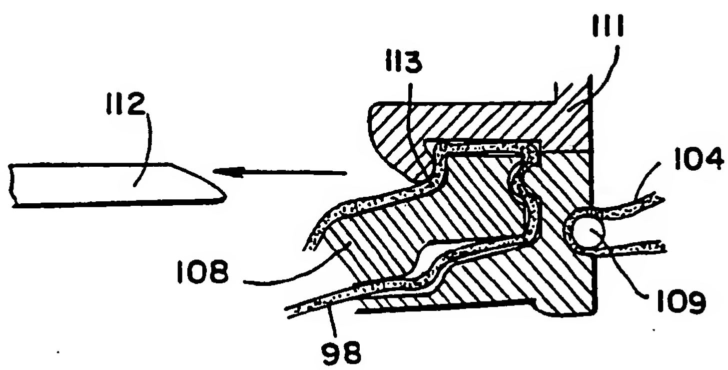

FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/10577

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A41D 13/00, 13/10
US CL :2/2, 161.7, 901
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 2/2, 161.7, 901, 167, 69

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS; search terms: oriented film, oreinted nylon, nylon, gloves

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- Y	US, A, 5,335,675 (WHEELER ET AL) 09 August 1994, see col. 1, lines 27-30.	13-15 ------- 16-28
X ---- Y	FR, A, 796,667 (BUGATTI) 11 April 1936, see Figs. 1-4.	47 ---- 16, 27
X ---- Y	UK, A, 2,245,148 (HILL) 02 January 1992, see page 3.	29 ----- 17-19, 24-26, 28
Y	US, A, 4,920,575 (BARTASIS ET AL) 01 May 1990, see Figs. 2 and 4.	20

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search

23 JANUARY 1996

Date of mailing of the international search report

07 MAR 1996

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer
Stacia Sinnik for
AMY B. VANATTA
Telephone No. (703) 308-0861

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,005,216 (BLACKBURN ET AL) 09 April 1991, see col.3 and 4.	17-19, 21, 22, 24-26, 28
Y	US, A, 5,163,183 (SMITH) 17 November 1992, see col. 3, lines 28-51.	23
A	US, A, 2,083,935 (ARNOLD) 15 June 1937, see entire document.	1-12
A	US, A, 2,025,357 (PAGAN) 24 December 1935, see entire document.	1-12
A	US, A, 4,995,119 (CODKIND) 26 February 1991, see entire document.	1-12

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